believes claim 1 meets the requirements of 35 U.S.C. §112. To the extent the Examiner may be inclined to maintain this rejection, Applicant welcomes any claim language proposed by the Examiner.

The prior art has been applied to reject only claims 1 and 6. All other claims are indicated to be allowable at paragraph 7 of the Office Action. Claims 1 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Thompson et al. (5,224,503). Claim 1 is further rejected under 35 U.S.C. 102(b) as being anticipated by the Dynamic Micro systems article.

Both claims 1 and 6 include straight spray nozzles and angle spray nozzles. In a preferred embodiment, the straight spray nozzle sprays towards the center or spin axis of the rotor. The angle spray nozzle then sprays at an angle relative to the straight spray nozzle.

None of the cited references disclose this claimed feature. Thompson et al., U.S. Patent No. 5,224,503 describes spray nozzles that are pointed directly "inward or directly towards the central axis of the processing chamber." (Col. 6, lns. 24-25). Additionally, Figure 7 in Thompson et al shows the liquid spray nozzles 93 all directed inwardly and pointing straight. Consequently, there is no angle spray nozzle as claimed.

Similarly, the Dynamic Micro Systems article fails to suggest an angle spray nozzle. The diagram only shows the spray nozzles all pointed in one direction and only at one angle.

In view of the foregoing, it is submitted that the Application is in condition for allowance. A Notice of Allowance is therefore requested.

Respectfully submitted,

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MARKED UP VERSION OF SPECIFICATIONS

Specification, p. 5, lns. 16-18:

(Amended) Fig. [14]15-20 are diagrams of spray patterns, nozzle orientation, and container/rotor movement, within the system shown in Figs. 13 and 14.

Specification, p. 23, ln. 13 - p. 24, ln. 2:

(Amended) As shown in Fig. 24, [T]to avoid interfering with adjacent spray nozzles, the downwardly oriented angle spray nozzles 432 on the second outer spray manifold 404, and the upwardly oriented angle spray nozzles 432 on the fourth outer spray manifold 408, are advantageously spaced apart from the next adjacent lower and upper (respectively) straight spray nozzle 430 by a distance sufficient to avoid extensively colliding spray patterns. Consequently, the spacing between the straight spray nozzles 430 and angle spray nozzles 432 on the second and fourth outer spray manifolds 404 and 408 preferably are not equal. In contrast, the spacing between the angle spray nozzles 432 on the first 402 and the third 406 outer spray manifolds, may be, and preferably is, approximately uniform.

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Specification, p. 25, lns. 12-18:

(Amended) As shown in Figs. 21, 22 and 23,[and 23] the angle spray nozzles 432 include a guide surface 434 extending over the nozzle outlet 436, to create a conical spray pattern oriented at angle θ to the axis end of the nozzle body 438. When installed, the axis N generally intersects with the center of rotation of the rotor C, while the guide surface 434 causes the spray pattern to extend at the angle θ relative to the axis N.

Specification, p. 27, lns. 13-23:

(Amended) For manufacturing efficiency, the manifolds 402-410 may be identical, with the nozzles 430[420] and 432 then subsequently installed in the left, right, up, or down directions, as described. Consequently, only a single manifold design, and only 2 nozzle designs, are needed, to manufacture all of the manifolds 402, 404, 406, 408 and 410. In this case, the manifold 404 having downwardly spraying nozzles 432, and the manifold 408 having upwardly spraying nozzles 432 can have nozzle holes closed off with a plug 460, to avoid having the up or down angled spray pattern interfere with an adjacent straight spray pattern.

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CLEAN VERSION OF SPECIFICATION

Specification, p. 5, lns. 16-18:

(Amended) Fig. 15-20 are diagrams of spray patterns, nozzle orientation, and container/rotor movement, within the system shown in Figs. 13 and 14.

Specification, p. 23, ln. 13 - p.. 24, ln. 2:

(Amended) As shown in Fig. 24, to avoid interfering with adjacent spray nozzles, the downwardly oriented angle spray nozzles 432 on the second outer spray manifold 404, and the upwardly oriented angle spray nozzles 432 on the fourth outer spray manifold 408, are advantageously spaced apart from the next adjacent lower and upper (respectively) straight spray nozzle 430 by a distance sufficient to avoid extensively colliding spray patterns. Consequently, the spacing between the straight spray nozzles 430 and angle spray nozzles 432 on the second and fourth outer spray manifolds 404 and 408 preferably are not equal. In contrast, the spacing between the angle spray nozzles 432 on the first 402 and the third 406 outer spray manifolds, may be, and preferably is, approximately uniform.

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Specification, p. 25, lns. 12-18:

(Amended) As shown in Figs. 21, 22 and 23, the angle spray nozzles 432 include a guide surface 434 extending over the nozzle outlet 436, to create a conical spray pattern oriented at angle θ to the axis end of the nozzle body 438. When installed, the axis N generally intersects with the center of rotation of the rotor C, while the guide surface 434 causes the spray pattern to extend at the angle θ relative to the axis N.

Specification, p. 27, lns. 13-23:

(Amended) For manufacturing efficiency, the manifolds 402-410 may be identical, with the nozzles 430 and 432 then subsequently installed in the left, right, up, or down directions, as described. Consequently, only a single manifold design, and only 2 nozzle designs, are needed, to manufacture all of the manifolds 402, 404, 406, 408 and 410. In this case, the manifold 404 having downwardly spraying nozzles 432, and the manifold 408 having upwardly spraying nozzles 432 can have nozzle holes closed off with a plug 460, to avoid having the up or down angled spray pattern interfere with an adjacent straight spray pattern.

CLAIM SHEET MARKED UP TO SHOW CHANGES

7. (Amended) The method of claim 6 where the first spray is sprayed in a pattern having a centerline or center axis which is [generally] horizontal, and where the second spray is also sprayed in a pattern having a centerline which is [generally] horizontal.

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CLEAN SET OF CLAIMS

1. A cleaning system for cleaning boxes used for moving and storing semiconductor wafers, comprising:

an enclosure;

a rotor rotatably supported within the enclosure, with the rotor having box positions for holding a box;

a plurality of spray manifolds positioned to spray a cleaning or rinsing fluid towards the rotor, with at least one of the spray manifolds having a plurality of straight spray nozzles, and also having at least one angle spray nozzle.

2. The cleaning system of claim 1 where the straight spray nozzles spray in a pattern having a horizontal central axis, and the angle spray nozzle sprays in a pattern having a central axis extending upwardly or downwardly at an angle relative to the horizontal central axis.

3. The cleaning system of claim 2 where the angle is from 30-60 degrees.

4. The cleaning system of claim 1 where the angle spray nozzle is oriented to spray in a pattern having a central axis directed opposite to the direction of rotation of the rotor.

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5. The cleaning system of claim 1 wherein the manifold has two angle nozzles separated by at least two straight spray nozzles.

6. A method for cleaning five sided boxes of the type used for carrying and storing semiconductor wafers, comprising the steps of:

placing the boxes in or on a rotor with the open side of the box facing radially outwardly and away from the center of the rotor;

spinning the rotor holding the boxes;

spraying a first spray of a cleaning liquid towards the center or spin axis of the rotor; and

spraying a second spray of the cleaning liquid at an angle relative to the first spray.

7. (Amended) The method of claim 6 where the first spray is sprayed in a pattern having a centerline or center axis which is horizontal, and where the second spray is also sprayed in a pattern having a centerline which is horizontal.

8. The method of claim 6 where the first spray is oriented horizontally and the second spray is oriented upwardly or downwardly at an angle relative to the first spray.

9. The method of claim 7 where the center axis of the first spray is aimed at the center of the rotor, and the centerline of the second spray is aimed at an angle to the first spray, so that the second spray sprays a pattern of liquid in a direction towards or opposite to the spin direction of the rotor.

SUBED 4 AT

10. (New) A cleaning system for cleaning boxes used for moving and storing semiconductor wafers, comprising:

an enclosure;

a rotor rotatably supported within the enclosure, with the rotor having box positions for holding a box;

a plurality of spray manifolds positioned to spray a cleaning or rinsing fluid towards the rotor, with at least one of the spray manifolds having a plurality of straight spray nozzles, and also having at least one angle spray nozzle, wherein the straight spray nozzles spray in a pattern having a horizontal central axis, and the angle spray nozzle sprays in a pattern having a central axis extending upwardly or downwardly at an angle relative to the horizontal central axis.

11. (New) A cleaning system for cleaning boxes used for moving and storing semiconductor wafers, comprising:

an enclosure;

a rotor rotatably supported within the enclosure, with the rotor having box positions for holding a box;

a plurality of spray manifolds positioned to spray a cleaning or rinsing fluid towards the rotor, with at least one of the spray manifolds having a plurality of straight spray nozzles, and also having at least one angle spray nozzle, wherein the angle spray nozzle is oriented to spray in a pattern having a central axis directed opposite to the direction of rotation of the rotor.

12. (New) A cleaning system for cleaning boxes used for moving and storing semiconductor wafers, comprising:

an enclosure;

a rotor rotatably supported within the enclosure, with the rotor having box positions for holding a box;

a plurality of spray manifolds positioned to spray a cleaning or rinsing fluid towards the rotor, with at least one of the spray manifolds, wherein the manifold has two angle nozzles separated by at least two straight spray nozzles.

13. (New) A method for cleaning five sided boxes of the type used for carrying and storing semiconductor wafers, comprising the steps of:

placing the boxes in or on a rotor with the open side of the box facing radially outwardly and away from the center of the rotor;

spinning the rotor holding the boxes;

spraying a first spray of a cleaning liquid towards the center or spin axis of the rotor; and

spraying a second spray of the cleaning liquid at an angle relative to the first spray;

where the first spray is sprayed in a pattern having a centerline or center axis which is horizontal, and where the second spray is also sprayed in a pattern having a centerline which is horizontal.

14. (New) A method for cleaning five sided boxes of the type used for carrying and storing semiconductor wafers, comprising the steps of:

placing the boxes in or on a rotor with the open side of the box facing radially outwardly and away from the center of the rotor;

spinning the rotor holding the boxes;

spraying a first spray of a cleaning liquid towards the center or spin axis of the rotor; and

spraying a second spray of the cleaning liquid at an angle relative to the first spray, with the first spray oriented horizontally and the second spray oriented upwardly or downwardly at an angle relative to the first spray.

15. (New) A cleaning system for cleaning boxes used for moving and storing semiconductor wafers, comprising:

an enclosure;

a rotor rotatably supported within the enclosure, with the rotor having box positions for holding a box;

a plurality of spray manifolds positioned to spray a cleaning or rinsing fluid towards the rotor, with at least one of the spray manifolds having one or more first spray nozzles, and also having one or more second spray nozzles, with the second spray nozzles at an angle of 10-80 degrees to the first spray nozzles.

16. (New) A method for cleaning boxes of the type used for carrying and storing semiconductor wafers, comprising the steps of:

placing the boxes in or on a rotor;

spinning the rotor holding the boxes;

spraying a first spray of a liquid from a first set of nozzles on a manifold in a first direction towards the boxes; and

spraying a second spray of the liquid from a second set of nozzles on the manifold in a second direction different from the first direction.